REMARKS

Applicant has reviewed and considered the Office Action dated October 18, 2006 and the references cited therein. In response thereto, claim 20 is amended, and no new matter has been added by this amendment. Claims 19, 20, 24-42, and 45 are pending.

Rejections Under 35 U.S.C. § 112

Claim 20 is rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement. Although Applicant respectfully traverses the Examiner's assertion that STEM is not described in the specification, the rejection is moot in light Applicant's amendment.

Double Patenting Rejection

Claims 19, 20, 24-42, and 45 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-26 of co-pending U.S. Patent Application No. 10/461,307 ("'307 Application"). While Applicant disagrees that the currently pending claims are obvious over those of the '307 Application, in order to expedite allowance of the present application, Applicant will consider a terminal disclaimer if necessary and appropriate when there is an indication of otherwise allowable subject matter.

Rejections Under 35 U.S.C. § 102

Claims 19, 24, 25-42, and 45 are rejected under 35 U.S.C. § 102(e) as being anticipated by Branton et al. (U.S. Patent No. 6,627,067). Applicant respectfully traverses the rejection for at least the following reasons.

Claim 19, as has been previously presented, is directed to a method of forming a membrane structure for use in a device to characterize polymer molecules. The method comprises, in part, "electron beam milling a nano-scale channel entirely through a self supporting portion of the thin film; and measuring the channel in-situ, wherein the drilling and measuring are performed during a single presentation to an instrument."

In contrast, Branton does not disclose, teach, or suggest electron beam milling a nano-scale channel entirely through a self supporting portion of the thin film. Rather, Branton discloses microfabrication of an aperture in a solid-state membrane that requires more than a single presentation to a single instrument. To create the aperture using the Branton method, each of the following steps is required. First, a cavity is etched in the membrane 134 as shown in Fig. 4G. *See* Branton, col. 13, ll. 3-5. This cavity is a "blind hole." That is, the cavity does not breach both sides of the membrane 134. In fact, the cavity terminates "at an interior point in the membrane." *Id.* col. 13, ll. 45-46; Fig. 4G. Furthermore, the dimensions of the cavity created can be, and are designed to be, much larger than the final diameter of the aperture. *Id.* col. 13, ll. 42-45. This cavity-forming step is performed with a lithographic instrument. *Id.* at col. 13, ll. 5-18.

Subsequently, after the cavity has been lithographically etched partially through the membrane 134, the membrane is "thinned" until the bottom portion of the pre-etched cavity is reached thereby creating an aperture, or thru-hole. *Id.* at col. 13, l. 56 - col. 14, l. 13. In fact, "the aperture formation process of the invention relies on structural thinning, rather than lithography, to define the final aperture geometry." *Id.* col. 13, ll. 38-40. The step of structural thinning is required in the Branton method because the cavity created in the first step has too large a diameter for the stated purpose of molecular and atomic scale evaluation of biopolymers to be formed entirely through the membrane and used as the final aperture. Thus, both the cavity creation step and the thinning step are required to create a "nano-scale channel entirely through a self-supporting portion of the thin film."

Therefore, Branton does not disclose, teach, or suggest electron beam milling a nano-scale channel entirely through a self supporting portion of the thin film. Branton discloses an etching step and a thinning step. The Examiner points to Branton column 13, lines 3-17 and column 13, line 55-column 14, line 34 and asserts that electron etching is equivalent to electron beam milling "because each is employed to remove the thin film in order to create a hole therethrough." Applicant respectfully, though strongly, traverses the Examiner's assertion for at least the following reasons.

As a first matter, Branton does not disclose electron beam milling of the cavity. Rather, Branton discloses electron beam lithography or photolithography of the cavity. Branton, col. 13, ll. 3-17. As is well known in the art, during electron beam lithography, the electron beam is used only to expose the electron beam resist layer, such as PMMA, which is then developed leaving a void in the resist layer, where the resist layer was exposed. The cavity is subsequently etched, typically by a reactive ion plasma gas of CF4, CHF3, or SF6. *See* Branton, col. 13, ll. 25-27 ("a relatively isotropic etch process, e.g., a reactive ion etch process, is carried out to form a bowl-shaped cavity . . .)." Thus, Branton does not disclose electron beam milling of the cavity.

Branton, however, discloses electron beam etching or assisted etching as an additional thinning process for enabling "controlled thinning of a structure to intersect a cavity on a surface opposite that being thinned." *Id.* at col. 14, ll. 13-19. That is, Branton discloses electron beam etching or assisted etching for purposes of carrying out the second step of the two-step process, i.e., the thinning step. As is typically understood in the art, electron beam etching means electron assisted chemical etching. Branton discloses that electron beam etching comprises structural thinning in order to create a completed aperture through the membrane 134. The invention, in fact, "relies" on structural thinning otherwise the aperture created would be too large for the stated purpose. Structural thinning involves thinning the entire exposed portion of the membrane 134, resulting in a thinned and weakened resulting membrane. As such, Applicant respectfully asserts that Branton does not disclose electron beam milling, which is the entirely different and novel technique disclosed by Applicant.

Thus, Branton does not disclose electron beam milling during either the cavity creation step or the thinning step. As such, nowhere does Branton disclose, teach, or suggest "electron beam milling a nano-scale channel entirely through a self supporting portion of the thin film." Branton merely discloses a required thinning step subsequent a cavity creation step. In contrast, electron beam milling an aperture does not suffer the same disadvantages as the thinning processes disclosed in Branton. In fact, Branton teaches away from electron beam milling since neither step of cavity creation (required by Branton) nor thinning (required by Branton) is necessary with electron beam milling, as claimed by Applicant. Electron beam milling creates an aperture of appropriate size without the requirement of first etching a cavity nor the need to thin back the membrane. It is respectfully asserted that Applicant has clearly disclosed a novel

technique of using direct electron beam milling and in-situ measurement to define a nano-scale channel. No intermediate cavity, such as disclosed and required by Branton, is necessary. Branton not only fails to teach the absence of a cavity creation step, but further discloses that a starting cavity is required.

Furthermore, Branton does not disclose, teach, or suggest "measuring the channel in-situ, wherein the drilling and measuring are performed during a single presentation to an instrument." Branton merely discloses a feedback mechanism used only during the thinning step, i.e., the second step of a two-step process, in which both steps are required to form the resulting aperture. As recited in Applicant's Claim 19, "the drilling and measuring are performed during a single presentation to an instrument." As previously mentioned, Branton does not disclose, teach, or suggest milling an aperture during a single presentation to an instrument and therefore, does not disclose, teach, or suggest "measuring the channel in-situ, wherein the drilling and measuring are performed during a single presentation to an instrument."

As such, Branton does not disclose, teach, or suggest "electron beam milling a nano-scale channel entirely through a self supporting portion of the thin film; and measuring the channel in-situ, wherein the drilling and measuring are performed during a single presentation to an instrument," as recited in Applicant's Claim 19, and the above argument obviates the basis for this ground of rejection. Claim 19 is not anticipated by Branton. Reconsideration and withdrawal of the rejection of Claim 19 is respectfully requested.

Because Claims 24-42 and 45 depend from Claim 19, and incorporate all the limitations of Claim 19, the above argument obviates the basis for this ground of rejection. Thus, Claims 24-42 and 45 are not anticipated by Branton. Reconsideration and withdrawal of the rejection is respectfully requested.

Rejections Under 35 U.S.C. § 103

Claim 20 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Branton et al. (U.S. Patent No. 6,627,067) in view of Nisch et al. (U.S. Patent No. 6,218,663). Applicant respectfully traverses the rejection for at least the following reasons.

Claim 19, as explained above, is directed to a method that includes, in part, "electron beam milling a nano-scale channel entirely through a self supporting portion of the thin film; and measuring the channel in-situ, wherein the drilling and measuring are performed during a single presentation to an instrument."

In contrast, Branton, as explained above, fails to teach or suggest the invention of Claim 19. Instead, Branton discloses an aperture-forming process that requires more than a single presentation to an instrument. The first step in the Branton process is a cavity-forming step that is performed with a lithographic instrument. *See* Branton, col. 13, ll. 5-18. The second step is a thinning step that is performed by any of several processes, except lithography, that "enable controlled thinning of a structure to intersect a cavity on a surface opposite that being thinned." *Id.* at col. 13, ll. 38-40; col. 14, ll. 13-19. In fact, Branton teaches away from electron beam milling since with electron beam milling, there is no requirement that a cavity be created and the membrane subsequently thinned in order to create an aperture of appropriate size, as is required by Branton. Thus, Branton fails to teach or suggest "electron beam milling a nano-scale channel entirely through a self supporting portion of the thin film; and measuring the channel in-situ, wherein the drilling and measuring are performed during a single presentation to an instrument."

Nisch fails to remedy the deficiencies of Branton. As noted in the Office Action, Nisch teaches ion etching for local thinning of a sample. *See* Nisch, Abstract. The purpose of Nisch is to "carry out target preparations under high-resolution observing conditions and to eliminate contaminant or reactive layers," such as an oxide layer. *Id.*, Abstract. Thus, Nisch, at most, discloses one method of performing the second step – the thinning step – of the Branton method. In fact, Branton teaches that the thinning step can be performed by various ion beam methods. *See* Branton, col. 14, ll. 14-16. Such a combination of Branton and Nisch thus results in an aperture-forming method that still requires a thinning step and more than a "single presentation to an instrument." Additionally, nothing in Branton or Nisch teaches or suggests modifying Branton's process to eliminate the two-steps comprising a cavity creation step and a subsequent thinning step and replace with electron beam milling a nano-scale channel entirely through a self supporting portion of the thin film.

Thus, neither Branton nor Nisch, alone or in combination, teach or suggest "electron beam milling a nano-scale channel entirely through a self supporting portion of the thin film; and measuring the channel in-situ, wherein the drilling and measuring are performed during a single presentation to an instrument" as recited in Applicant's claim 19. Claim 19 is, therefore, not made obvious by Branton in view of Nisch.

Because claim 20 depends directly from claim 19, and incorporates all the limitations of claim 19, the above arguments obviate the basis for this ground of rejection. Thus, claim 20 is not made obvious by Branton in view of Nisch. Reconsideration and withdrawal of the rejection are respectfully requested.

Conclusion

In view of the above, it is respectfully submitted that the present application is in condition for allowance. Reconsideration of the present application and a favorable response are respectfully requested.

No additional claim fees should be generated by this paper. However, the Commissioner is hereby authorized to charge any fee deficiency associated with this paper to Deposit Account No. 04-1420.

Respectfully submitted,

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